

C L A I M S

1. Device for carrying out a plasma enhanced process, in particular a plasma enhanced chemical vapour deposition process, the device comprising within a vacuum chamber a magnetron electrode (32), a positioning means and a gas supply means, the magnetron electrode comprising a flat magnetron face (20) with peripheral and central magnetic poles of opposite polarities and further comprising means for producing a high frequency alternating electric field, the positioning means being equipped for positioning a substrate (25) with a surface to be treated facing the magnetron face (20) and the gas supply means being equipped for supplying a process gas or process gas mixture to the space between the magnetron face (20) and the surface to be treated, **characterized** in that the magnetron electrode (32) is of the unbalanced type and that a distance between the magnetron face (20) and the positioning means is adapted to the magnetic field created by the magnetron electrode (32) such that there is a visible plasma band running between darker tunnels (11) formed by magnetic field lines (10) extending between peripheral and central magnetic poles of the magnetron face (20) and the surface to be treated, the plasma band having a minimum width but having towards the surface to be treated a homogeneous brightness.
2. Device according to claim 1, **characterized** in that a distance (A-C) between the surface to be treated and the magnetron face (20) is at least 2% larger than the visible height (A-B) of the tunnels (11).
3. Device according to claim 1 or 2, **characterized** in that the distance (A-C) between the surface to be treated and the magnetron face (20) is at the most 20% larger than the visible height (A-B) of the tunnels (11).

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4. Device according to one of claims 1 to 3, **characterized** in that the magnetic strength of the central magnetic pole of the magnetron face (20) is about half of the magnetic strength of the peripheral pole.
5. Device according to one of claims 1 to 4, **characterized** the magnetron electrode (32) comprises an electrode element (21) being connected to a source of an alternating voltage (34).
6. Device according to claim 5, **characterized** in that the positioning means and/or the substrate (25) are arranged to be electrically grounded, electrically floating or negatively biased.
- 10 7. Device according to one of claims 1 to 6, **characterized** in that the positioning means is a rotating drum (30) and that a plurality of magnetron electrodes (32) having rectangular faces being arranged with their length parallel to the rotation axis of the drum (30) are arranged around part of the circumference of the drum (30).
- 15 8. Device according to claim 7, **characterized** in that the gas supply means comprises gas supply lines (33) extending parallel to the drum axis between the magnetron faces (20).
- 20 9. Device according to one of claims 7 or 8, **characterized** in that of the plurality of magnetrons (32) each magnetron (32) is connected to a separate power supply.

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10. Use of a device according to one of claims 1 to 9 for carrying out a plasma enhanced chemical vapour deposition process.
11. Use of a device according to one of claims 1 to 9 for depositing silicon oxide using a process gas comprising an organosilicon compound and oxygen.
- 5 12. Use according to claim 11, **characterized** in that the substrate is a web of polymer film material being coated for improving its barrier properties.